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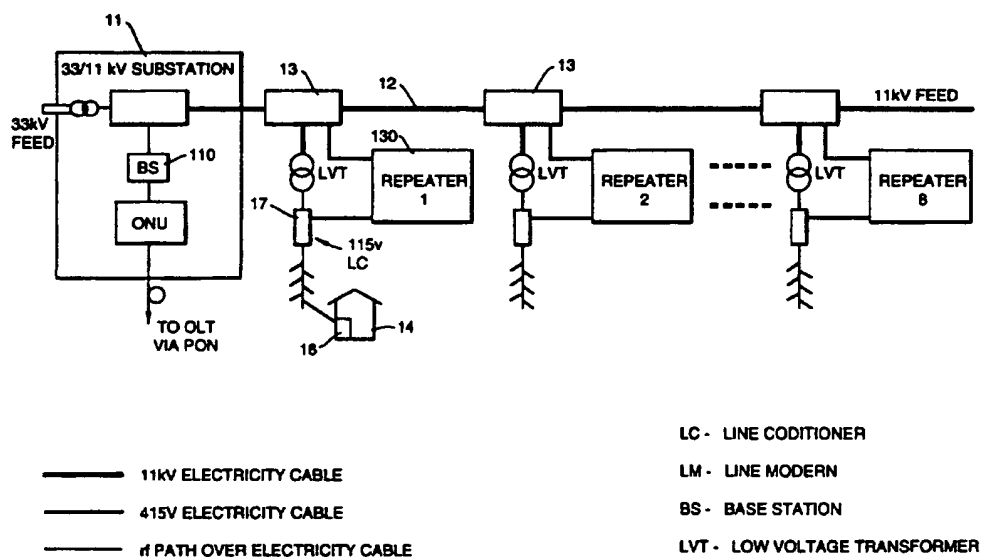
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(56) Documents Cited  
GB 1535834 A US 4008467 A US 3944723 A  
US 3911415 A

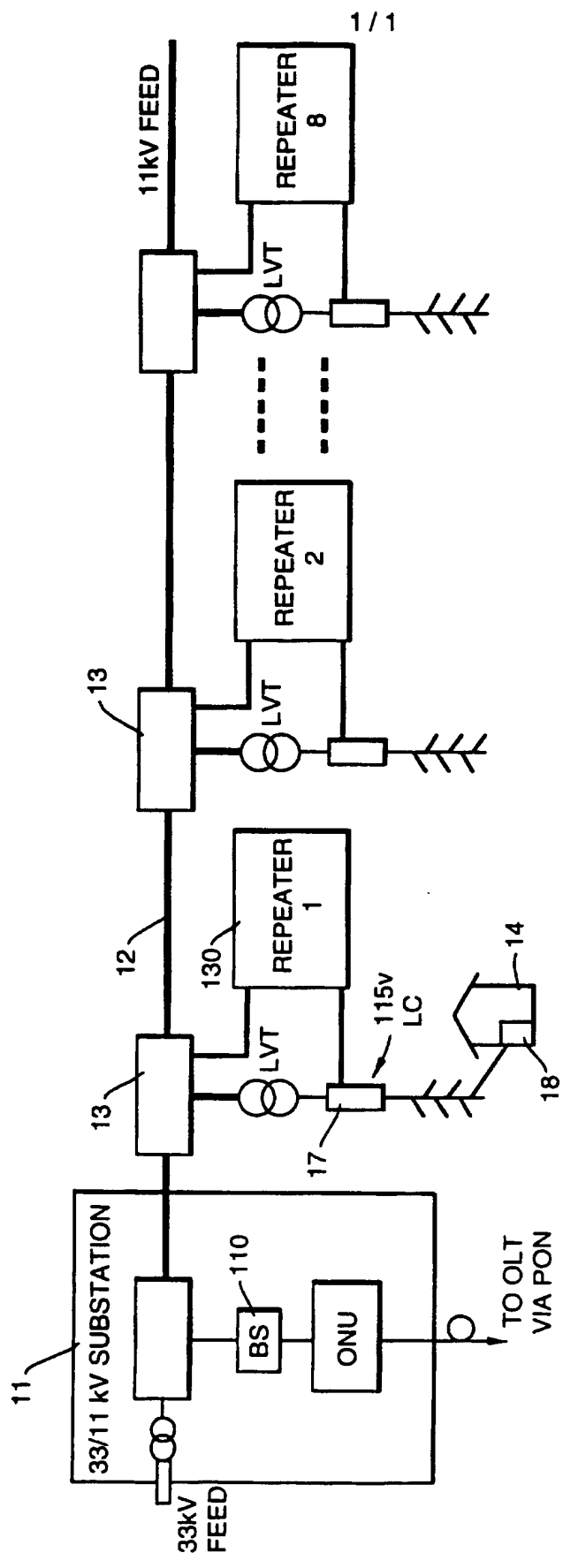
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UK CL (Edition M ) H4R RTC RTR RTSR RTSU RTT  
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## (54) Communications system using power distribution network

(57) Speech and/or data communications are provided over an electrical power distribution network where a base station 110, disposed at a 33kV/11kV substation 11, feeds a number of local 11kV/415V distribution stations 13 each of which supplies a number of customer premises 14. Repeaters 130 are provided one to each local distribution station whereby to amplify communications traffic between customers and the base station. The arrangement allows a single base station to serve a large number of customers. Typically the base station is coupled to a passive optical network via interface ONV.



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- LC - LINE CODITIONER
- LM - LINE MODERN
- BS - BASE STATION
- LVT - LOW VOLTAGE TRANSFORMER

- 11kV ELECTRICITY CABLE
- 415V ELECTRICITY CABLE
- if PATH OVER ELECTRICITY CABLE

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**COMMUNICATIONS SYSTEM**

This invention relates to communications systems, and in particular to a system in which subscribers are interconnected via a pathway including the electrical mains supply.

A number of systems have been described to effect voice and/or data communications via the electric mains e.g. to provide a local or in-building service. In such a system the communications traffic is transported on a high frequency carrier which is retrieved by the customer from the electrical supply via suitable interface terminal equipment.

A disadvantage of such systems is their restriction to a relatively small area. To prevent interference with other communications systems there is a strict limitation on the signal power. Also, the electric mains wiring is designed as a power supply system and is thus generally of low efficiency when used as a transmission line. One approach to this problem is described in Specification No. GB-A-2 272 350. This document describes a system in which communications traffic is injected into the low voltage (415 volt three phase) supply to a local group of consumers. While such a system can provide an effective communications service, the high cost of providing terminal equipment to every local distribution area in order to provide a wide area system is commercially unattractive.

The object of the invention is to minimise or to overcome this disadvantage.

According to the invention there is provided an arrangement for providing speech and/or data communication over an electrical power distribution

network incorporating one or more transformer stations each serving a plurality of local distribution stations to which customers are connected, the system including base stations one disposed at each said transformer station, and repeaters one disposed at each said local distribution station served by that transformer station whereby to provide amplification of communications traffic between customers and that base station.

Because base stations are provided only at substations and not at the local distribution stations, a significant cost saving can be achieved in comparison with conventional systems.

An embodiment of the invention will now be described with reference to the accompanying drawings in which the single figure is a schematic diagram of a communications system.

Referring to the drawing, the communications system provides a service over an electrical distribution network comprising a substation 11 which transforms a high voltage feed, e.g. at 33 kV, to a lower voltage supply, typically 11kV via a feed line 12, to a plurality of local stations 13 for distribution to customer premises 13 at the standard supply voltage of 415 volts (three phase).

A communications service is provided to the customer 14 over this network on a radio frequency carrier via a base station 110 disposed at the substation 11 and which provides an interface to a communications network. Typically the base station is coupled to a passive optical network via an optical network unit (ONU) 15 which provides an interface between the radio frequency and optical transmission protocols.

The base station couples communications traffic to the 11kV line feeding the local distribution stations 12. At each local station 13 a bidirectional repeater 130 regenerates the communications traffic between the 11kV feed line 12 and the low voltage 415 volt supply network 16 to the customers premises 14. Advantageously a line conditioner 17 is provided in each 415 volt line to overcome cable losses.

Each customer premises 14 is provided with a terminal unit 18 which provides a communications interface to the electrical supply and also provides the necessary electrical isolation from the supply voltage.

It will be appreciated that the use of repeaters disposed at the local distribution centres allows the use of a relatively low power output by the base station and by the customer terminal units thus allowing a large number of customers to be served without exceeding the restrictions on the level of leaked radiation.

The transmission carrier frequency will be selected according to the particular form of communication required in order to provide an appropriate bandwidth. Typically this frequency will be in the range 1 to 20 MHz. The format may be analogue or digital and, advantageously, conforms to an industry standard such as Cablephone, CT2 or DBCT. The arrangement may be used for FDMA, TDMA or CDMA based communication between the customers and the base station.

It will be appreciated that although the embodiment described above employs a base station disposed at the 33 kV/11kV substation, the principle of the technique may be extended to further hierarchical levels by providing a base station at a higher voltage station and by providing further repeaters at the substation.

## **CLAIMS**

1. An arrangement for providing speech and/or data communication over an electrical power distribution network incorporating one or more transformer stations each serving a plurality of local distribution stations to which customers are connected, the system including base stations one disposed at each said transformer station, and repeaters one disposed at each said local distribution station served by that transformer station whereby to provide amplification of communications traffic between customers and that base station.
2. An arrangement as claimed in claim 1, wherein such base station is coupled to an external communications network.
3. An arrangement as claimed in claim 2, wherein the external network incorporates a passive optical network to which the base station is coupled.
4. An arrangement for providing speech and/or data communication over an electrical power distribution network substantially as described herein with reference to and as shown in the accompanying drawings.
5. An electrical power distribution network incorporating one or more communications arrangements as claimed in any one of claims 1 to 4.

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**Patents Act 1977**  
**Examiner's report to the Comptroller under Section 17**  
**(The Search report)**

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**Relevant Technical Fields**

- (i) UK CI (Ed.M)     H4R (RTC, RTSR, RTSU, RTR, RTT)  
(ii) Int CI (Ed.5)     H04B 3/54, 3/56, 3/58

Search Examiner  
MR K WILLIAMS

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6 DECEMBER 1994

**Databases (see below)**

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE DATABASE: WPI

Documents considered relevant following a search in respect of Claims :-  
1-5

**Categories of documents**

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|---|---|
| <b>X:</b> Document indicating lack of novelty or of inventive step.   | <b>P:</b> Document published on or after the declared priority date but before the filing date of the present application.        |
| <b>Y:</b> Document indicating lack of inventive step if combined with one or more other documents of the same category. | <b>E:</b> Patent document published on or after, but with priority date earlier than, the filing date of the present application. |
| <b>A:</b> Document indicating technological background and/or state of the art.   | <b>&amp;:</b> Member of the same patent family; corresponding document.   |

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 1535834	(WESTINGHOUSE ELECTRIC CORP) & US 3967264 page 4, lines 5-45	1, 2
X	US 4008467	(WESTINGHOUSE ELECTRIC CORP) Figure 1	1
X	US 3944723	(GENERAL ELECTRIC CO) Figure 1; column 3, lines 36-52	1
X	US 3911415	(WESTINGHOUSE ELECTRIC CORP) Figure 1	1

**Databases:** The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).